LAPORAN PENELITIAN LANJUT

BIDANG PENELITIAN KEILMUAN

UNIVERSITAS TERBUKA

MODEL ANALISIS PENCAPAIAN BELAJAR MAHASISWA PENDIDIKAN FISIKA

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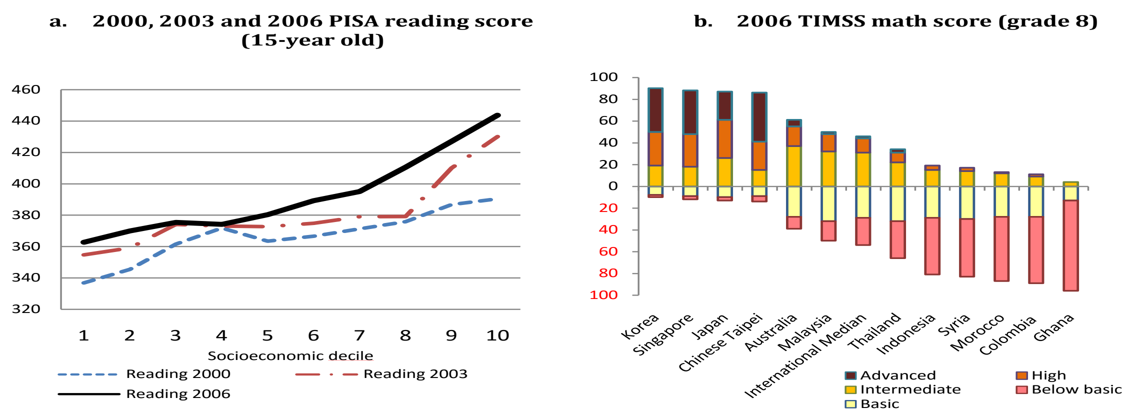
Bab I Pendahuluan

A. Latar Belakang

Penelitian ini dilakukan di Program Studi S1 Pendidikan Fisika (untuk selanjutnya akan disebut PFIS) yang merupakan salah satu dari 10 program studi S1 di Fakultas Kedosenan dan Ilmu Pendidikan Universitas Terbuka (FKIP-UT). PFIS mulai menerima mahasiswa sejak tahun 1986. Sejak saat itu, alat evaluasi pencapaian belajar mahasiswa PFIS umumnya berbentuk tes objektif, termasuk untuk matakuliah PEFI4302 (Evaluasi Pembelajaran Fisika), PEFI4101 (Fisika Dasar I) dan PEFI4102 (Fisika Dasar II). Tes uraian digunakan pada ‘matakuliah’ ujian komprehensif yang kemudian disempurnakan menjadi ‘matakuliah’ TAP (Tugas Akhir Program).

Kualitas tes objektif selama ini diuji dengan menggunakan analisis soal klasik untuk mengetahui reliabilitas soal secara keseluruhan dan karakteristik soal (‘tingkat kesukaran’ dan daya beda kunci serta opsi pengecoh). Namun, beberapa tahun ke belakang, analisis soal ini juga tidak jelas dilaksanakan atau tidak. Setidaknya, staf akademik FKIP-UT tidak lagi ditugaskan untuk memeriksa hasil analisis soal (dan menetapkan kategori grade yang digunakan untuk menilai pencapaian belajar mahasiswa).

Di samping persoalan penting lain seperti jumlah mahasiswa aktif yang cenderung turun, misalnya, keadaan ini memprihatinkan, karena kualitas atau validitas soal diabaikan. Gb. 1 menunjukkan sebuah potret yang menyatakan bahwa pencapaian belajar itu perlu diperhatikan, selain juga memperlihatkan bahwa pencapaian belajar itu masih tergantung pada latar belakang sosial-ekonomi (sekali pun sekarang banyak pakar menyatakan dalam banyak bidang kehidupan latar belakang sosial ekonomi ini sudah tidak relevan lagi).



Gb. 1 Potret pencapaian belajar di Indonesia (Jalal, 2010).

Lebih memprihatinkan lagi, jika kita mengingat bahwa untuk TAP, misalnya, kita sudah atau pernah mengupayakan untuk membuat inovasi dengan menjadikannya berbasis masalah. Dalam tes objektif umumnya, bukan saja analisis soal diabaikan, tapi juga upaya inovasi, misalnya, seperti yang diurai berikut, belum pernah dilakukan,

[soal perlu tidak dapat] dijawab kecuali testi memahami situasi realistik yang melibatkan pelaku dan motif manusiawi, sehingga kualitas WYTIWYG (*what you test is what you get*) sistem memastikan testi dididik untuk mengatasi situasi seperti itu (h. 14)]. Profesi ahli konstruksi tes kreatif tentang masalah yang sebelumnya tidak terpikirkan saat ini belum ada. Ada kesejajaran dengan industri periklanan. Lima puluh tahun lalu, para manajer menulis iklan di balik amplop saat dalam perjalanan ke kantornya. Sekarang ada karir khusus yaitu *copywriter* yang mempunyai spesialisasi menciptakan pernyataan baru yang menarik dan membuat penasaran masyarakat. Kita perlu profesi serupa, yaitu *situation writer* untuk menciptakan situasi masalah baru dan menarik dalam rangka menguji atau mengetes pemahaman seseorang (Ormell, 2000:47).

Mengingat latar belakang seperti itu, penelitian mencoba untuk meningkatkan kualitas tes dengan cara mencari model analisis pencapaian belajar mahasiswa.

B. Permasalahan

Permasalahan yang dikaji penelitian ini dibagi menjadi 2 sub permasalahan sebagai berikut.

1. Profil pencapaian pencapaian belajar. Dalam penelitian ini diasumsikan mahasiswa PFIS di pulau Jawa (selanjutnya disebut mahasiswa Jawa) dan di luar pulau Jawa (selanjutnya disebut mahasiswa Luar Jawa) mempunyai jumlah yang relatif sama, namun mempunyai latar belakang sosial-ekonomi yang berbeda. Oleh karena itu, istilah profil pencapaian belajar digunakan untuk mendeskripsikan pencapaian belajar mahasiswa Jawa dan mahasiswa Luar Jawa. Aspek profil dipilih skor mentah mahasiswa, reliabilitas soal secara keseluruhan dan karakteristik soal (‘tingkat kesukaran’ dan daya beda kunci serta opsi pengecoh) untuk masing-masing mahasiswa Jawa dan mahasiswa Luar Jawa.
2. Model analisis. Ke 4 validitas soal (muka, isi, konstruk and prediktif) dikaji, kecuali validitas prediktif. Validitas muka dan isi dikaji secara tekstual, sementara validitas konstruk diuji dengan menggunakan faktor analisis.

C. Pembatasan Permasalahan

Pencapaian belajar mahasiswa yang diteliti hanya pencapaian belajar pada matakuliah PEFI4302 (Evaluasi Pembelajaran Fisika), PEFI4101 (Fisika Dasar I) dan PEFI4102 (Fisika Dasar II). PEFI4101 dan PEFI4102 dipilih karena kedua matakuliah tersebut merupakan matakuliah dasar yang harus dikuasai mahasiswa PFIS, sementara PEFI4302 dipilih untuk menjadi acuan atau titik tolak inovasi dalam pengembangan dan analisis soal atau dalam rangka WYTIWYG (*what you test is what you get*) tersebut di sub bab A. (Selain itu, PEFI4101 dan PEFI4102 merupakan matakuliah eksak dalam arti banyak hitung-hitungan matematika-fisika, sementara PEFI4302 lebih merupakan matakuliah ilmu sosial umumnya).

D. Tujuan Penelitian

Penelitian secara umum bertujuan untuk mencari model analisis pencapaian belajar mahasiswa PFIS FKIP-UT. Secara lebih khusus lagi penelitian bertujuan untuk:

1. Mengkaji profil pencapaian belajar mahasiswa PFIS FKIP-UT.
2. Merumuskan model analisis pencapaian belajar mahasiswa PFIS FKIP-UT.

E. Manfaat Penelitian

Beberapa manfaat penelitian adalah sebagai berikut.

1. Profil pencapaian belajar mahasiswa PFIS FKIP-UT terkaji, sehingga menjadi untuk merumuskan model analisis pembelajaran.
2. Terumuskannya model analisis pencapaian belajar mahasiswa PFIS FKIP-UT.

Bab II Kajian Pustaka

A. Pencapaian Belajar

Dosen tidak dapat efektif jika tidak dapat mengukur secara akurat pencapaian siswanya. Mengukur secara akurat ini penting sebab dosen tidak dapat membantu siswanya secara efektif jika tidak mengetahui pengetahuan dan ketrampilan yang dikuasai siswanya dan pelajaran apa yang masih menjadi masalah bagi siswanya. Hal yang sama pentingnya adalah dosen tidak dapat memperbaiki jika tidak memperoleh indikasi efektifitas dalam mengajar. Yang dimaksud dengan pencapaian adalah pengetahuan, pengertian, dan ketrampilan yang dikuasai sebagai hasil pengalaman pendidikan khusus. Kita mengartikan pengetahuan sebagai bagian tertentu dari informasi. Pengertian mempunyai implikasi kemampuan mengekspresikan pengetahuan ini ke berbagai cara, melihat hubungan dengan pengetahuan lain, dan dapat mengaplikasikannya ke situasi baru, contoh dan masalah. Ketrampilan kita artikan mengetahui bagaimana mengerjakan sesuatu. Kita mengukur untuk menggambarkan pengetahuan dan ketrampilan siswa atau sebagai dasar untuk mengambil keputusan. Terdapat beberapa alasan mengapa mengukur pencapaian siswa.

Fungsi penting pada tes pencapaian adalah memberikan umpan balik dengan mempertimbangkan efektifitas pembelajaran. Pengetahuan pada performance siswa membantu dosen untuk mengevaluasi pembelajaran mereka dengan menunjuk area dimana pembelajaran telah efektif dan area dimana siswa belum menguasai. Informasi ini dapat dignakan untuk merencanakan pembelajaran selanjutnya dan memberikan nasehat untuk metode pembelajaran alternatif. Umpan balik memberikan beberapa fungsi. Pertama menginformasikan kepada dosen dan siswa mengenai tingkat performance siswa pada suatu pembelajaran. Kedua memberikan informasi diagnostic yang dapat digunakan untuk merencanaka pembelajaran selanjutnya, dan atau remedial. Ketiga dengan mempertimbangkan hasil beberapa tes, kita dapat memperoleh pengukuran kemajuan dan perbaikan siswa. Selain sebagai umpan balik alasan mengukur pencapaian adalah untuk memberikan motivasi, menentukan peringkat, profisiensi adalah memberikan sertifikat bahwa siswa telah mencapai tingkat kemampuan (minimal) dalam suau bidang tertentu.. Hasil pencapaian tes dapat juga digunakan pada evaluasi pembelajaran (http://putrohari.tripod.com/mengukur_pencapaian.htm)

B. Fisika Dasar I, Fisika Dasar II dan Evaluasi Pembelajaran Fisika

Matakuliah Evaluasi Pembelajaran Fisika berisi materi pembelajaran sebagai berikut.

No	Modul	Kegiatan Belajar
1	Hakekat evaluasi pembelajaran	Pengertian tes, pengukuran dan penilaian
		Pengelompokkan alat ukur
2	Pengembangan tes uraian	Mengapa tes uraian?
		Bagaimana menulis tes uraian?
		Bagaimana membuat perencanaan tes uraian?
3	Pengembangan tes objektif	Mengapa menggunakan tes objektif?
		Bagaimana menulis tes objektif?
		Bagaimana merencanakan tes objektif yang baik?
4	Pengembangan alat penilaian non-tes	Pengembangan pedoman observasi dan skala sikap.
		Angket, wawancara dan protofolio
5	Kualitas alat penilaian	Validitas dan reliabilitas hasil pengukuran
		Analisis dan perbaikan butir soal
6	Mengolah hasil pengukuran	Bagaimana memeriksa dan mengolah data hasil pengukuran?
		Statistika sederhana
7	Pengembangan tes objektif dan uraian pembelajaran fisika	Pengembangan tes objektif
		Pengembangan tes uraian
8	Pengembangan penilaian afektif dan psikomotorik pembelajaran fisika	Penilaian afektif
		Penilaian psikomotorik
9	Pengembangan penilaian portofolio pembelajaran fisika	Penilaian portofolio dalam pembelajaran fisika
		Menyusun penilaian fortofolio dalam pembelajaran fisika

Matakuliah Fisika Dasar I berisi materi pembelajaran sebagai berikut.

No	Modul	Kegiatan Belajar
1	Pengukuran dan sistem satuan dalam fisika	Besaran dan satuan
		Pengukuran dan alat ukur
2	Kinematika partikel	Gerak lurus
		Gerak pada bidang datar

No	Modul	Kegiatan Belajar
3	Dinamika partikel	Kelembaman
		Gaya dan gerak
4	Zat dan energi	Sumber energi
		Hukum kekekalan energy
5	Energi dan impuls	Kerja dan energy
		Momentum dan impuls
6	Benda tegar	Rotasi
		Gerak benda tegar
7	Fluida	Fluida statika
		Fluida dinamika
		Hukum Bernoulli
8	Gas ideal dan sifat termal materi	Suhu, kalor dan pengukurannya
		Gas ideal
		Sifat termal materi
9	Termodinamika	Hukum I termodinamika dan penerapannya
		Hukum II termodinamika dan penerapannya
		Entropi

Matakuliah Fisika Dasar I berisi materi pembelajaran sebagai berikut.

No	Modul	Kegiatan Belajar
1	Getaran dan bunyi	Getaran
		Bunyi
2	Gelombang dan pemantulannya	Hukum pemantulan gelombang
		Pemantulan gelombang optik
3	Pembiasan gelombang	Hukum pembiasan gelombang
		Pembiasan gelombang optik
4	Alat-alat optic	Alat optik pandang dekat
		Alat optik pandang jauh dan daya pisah alat optic
5	Interferensi, difraksi dan polarisasi	Interferensi gelombang
		Difraksi dan kisi difraksi
		Polarisasi gelombang
6	Listrik statis	Muatan listrik
		Gaya Coulomb
7	Arus listrik dan rangkaian listrik	Arus listrik
		Rangkaian listrik searah
		Susunan hambatan dan kapasitor
8	Arus bolak-balik	Sirkuit arus searah mengandug kapasitor dan induktor
		Tegangan dan arus bolak-balik
9	Medan magnet dan induksi elektromagnetik	Medan magnet
		Induksi elektromagnetik

C. Model Analisis Pencapaian Belajar

Scientific modelling is a scientific activity, the aim of which is to make a particular part or feature of the world easier to understand, define, quantify, visualize, or simulate by referencing it to existing and usually commonly accepted knowledge. It requires selecting and identifying relevant aspects of a situation in the real world and then using different types of models for different aims, such as conceptual models to better understand, operational models to operationalize, mathematical models to quantify, and graphical models to visualize the subject (http://en.wikipedia.org/wiki/Scientific_modelling).

Bab III Metodologi Penelitian

A. Waktu dan Tempat Penelitan

Penelitian dilakukan atas data yang secara primer tersedia pada data base yang dipunyai UT.Waktu penelitian dilakukan pada tahun 2012

B. Metode Analisis Data

Penelitian yang awalnya akan menggunakan analisis faktor ternyata tidak feasibel mengingat data peserta yang relatif sedikit. Sebagai alternatif dengan perluasan sampel studi metode analisis dilakukan dengan analisis isi terhadap data statistik yang diperoleh.

C. Sampel dan Populasi

Sampel studi yang awalnya hanya tiga matakuliah yaitu Fisika Dasar 1, Fisika Dasr 2 dan Evaluasi Pembelajaran Fisika dengan adanya perubahan metode analisis data diubah menjadi total sampel atau seluruh populasi matakuliah yang mempunyai kode PEFI.

Bab IV Temuan dan Pembahasan

A. Temuan

There are 33 courses offerred specifically focused on physics education i.e. courses label with PEFI followed by number like 4101 to form PEFI4101 Basic Physics 1. Total number students registered to these 33 courses are 2491students. Several further facts, observation, and concerns related to the data are as follow:

1. 2148 students (84.2% of 2491 students) got in the final exam average raw score 42.7 (out of 100 as perfect score) average maximum score 68.5 and average minimum score 21.9. It is thus of interest a) to inquire the reasons why the remaining 15.8% of the students didn't get final exam score, and b) to sort out reasons why out of these 84.2% students, 12 students (in 7 courses) misteriously didn't have final score. Logically, every students who have raw score must have final score. Meanwhile, the same number of students i.e. 12 students seem to have final score out of score derived from online tutorials (called tuton) in 6 courses. Observing the sameness of the number of final score missing and of final score gained, it might be that some other reasons might –accidentally or otherwise- have caused this sameness of number misplaced final score. Other observation is the strange score difference (due to some unknown reasons) +0,1 or -0.1 of average score in the final score compared to aversage raw score of PEFI Biophysics, PEFI4311 Optics and PEFI4301 Stengthening Teaching and Professional Competencies. Other differences, with grand average (about) 1.8, is certainly due to the contibution of TTM or tuton. In view of this practically no contribution of TTM or tuton to the final score, as well as in view of observations mentioned in point 2 and 3 below, it should logically be questioned if TTM or tuton is a worthwhile effort to ensure students' learning achievement.
2. All of the 33 courses offered provided tuton, but for 4 tuton of the course of practicum 1 and 2 (PEFI4309 and PEFI4417), and the course of Stengthening Teaching and Professional Competencies (PEFI4304 and PEFI4501). The number of participant in the 29 tuton offered is 474 (19.0% of 2491 students). The average tuton score 59.6 (out of 100 as perfect score) average maximum score 90.1 and average minimum score 25.2. This means that only about 1 out 5 students utilized tuton as their learning source, while the scores (i.e. the average score of

59.6 and average minimum score 25.2) shows they utilized it quite in a half-hearthedly manner.

3. Beside tuton which are offered for almost all courses, face to face tutorials (shortened as TTM in Bahasa) is practically offered for all courses, but it is a fully students initiatives both financially and operationally speaking, with the regional and central office facilitating license and acknowledgement of the results of TTM.In 2012, while tuton contributes 30% to the final score, TTM contributes 50%. Nowadays, such contributions is still the same, but with a further requirement that the exam raw score achieved a minimum of 30 (out of 100 as perfect score). It can be seen the data that only 60 (2.4% out of 2491) students utilized TTM in 2 courses i.e. Basic Physics I and Evaluation of Physics Teaching (PEFI4101 and PEFI4302). The average TTM score 83.9 (out of 100 as perfect score) average maximum score 96.5 and average minimum score 40.7. In this case, eventhough average minimum score 40.7 for PEFI4101 is only 3.75, TTM score is much better than tuton score, especially that of the course of PEFI4301. However, average minimum score of 3.75 in PEFI4101 raised concern of why such student wasted their resources for practically nothing (ie. the score 3.75 practically contributed nothing to final score, nor it shows such student has learned something in the course, especially when we should take note that PEFI4101 is a very basic knowledge about physics, the core competency of the study program the students took). Next, it should be ascertained that the fact only 2.4% students utilized TTM is due to the fact that students are distributed, geographically speaking, over a very wide area so that it is very difficult to have a minimum of 20 students to arrange themselves as a group to conduct TTM as is required by the regulation decreed by the central office.
4. Lastly, grade category is coded 1, 2 or 3. This basically means that courses graded by 3 is for students more difficult that those grades by 2 which in turn is more difficult that those graded by 1. The category 1, 2 and 3 also means the grading process in 3 is more lenient than that in 2 which in turn more lenient than that in 1. These differences in course difficulty is shown by the grand average of courses graded by 1, 2, and 3 is respectively 85.9, 51.4 and 35.5. Observing the grand average of 'grade categoty' 2.6 (close to most difficult and graded mostleniently) and the number of courses considered most difficult is 20 courses, difficult 6 courses and less difficult only 4 courses, it should be traced what factors likely to influence

such observation. It also should be carefully monitored if the same or similar trend occurred in every semester.

B. Pembahasan

A further issue of special interest is how well are students achievement, especially in view of the possible differences between male and female students initial, innate or otherwise competencies. Reap & Cavallo (1992) were unable to find any effects of gender on approaches employed by students when learning. However, several studies show that male students are far more successful than their female peers in comprehending physics (see Chambers & Andre, 1997; Beaton et al., 1996; Kahle & Meece, 1994; Wee et al., 1993). Though these studies were conducted in western countries, they may not have been culture specific. Wee et al. (1993) analyzed the performance of a group of university students in Singapore during exams. They found that female students used learning strategies that were less successful in exams than male students. They came to the conclusion that female students prefer independent learning strategies far less than their male peers. Study by Ateş (2008, in Selçuk 2010), uses Turkish sample and found that the relationship between gender and student achievement depends on the questions asked. This study suggests there is difference between female and male student ability in the levels of conceptual comprehension. Pollock, Finkelstein, & Kost (2007); Kost, Pollock, & Finkelstein (2009); Kost-Smith, Pollock, & Finkelstein (2010) invariably shows that male students are more successful than their female peers at learning physics. The differences in students achievement might be accounted by student’s age (Beaton et al., 1996; Kahle & Meece, 1994), attitude and interest towards physics (see Kahle, Parker, Rennie, & Riley, 1993; Baker & Leary, 1995; Farenga & Joyce, 1997; Jones, Hove, & Rua, 2000) and social and linguistic behaviour (Stadler, Duit, & Benke, 2000) and learning strategies (see Green & Oxford, 1995; Yumuşak, Sungur, & Çakıroğlu, 2007; Shin, Jeon, & Yang, 2010).

The differences in learning achievement between male and female students might be related to their differences in learning strategies. Yumuşak et al. (2007) determined that "rehearsal" and "organization" contributed significantly to the prediction of achievement scores in science, particularly in biology. On a more particular level, Selçuk (2010) showed that female students employ rehearsal (repetition, rote memorization) and organization strategies more often than male students. The differences might also be accounted by some other factors. Park (1997) found that good performance by students in language learning strongly related to their use of learning strategies. Thiessen and Blasius (2008) and Dermitzaki, Andreou, and Paraskeva (2008) support Park in terms of performance in mathematics and reading comprehension respectively. Pintrich, Smith, Garcia and McKeachie (1993) showed that all learning strategy scales, except for "rehearsal," (repetition, rote memorization) were positively and significantly correlated with student final achievement. The latter is supported by Cavallo, Rozman, Blickenstaff and Walker (2003) who found that rote learning (or memorization) negatively predicted achievement in science courses.

Selçuk (2010) in mentioning "rehearsal" and "organization" specifically refers to the revised Learning Strategies Scale for Physics Learning (R-LSSPL), a 39-item scale developed to measure learning strategies used by students. Each item is evaluated on a 5-point Likert-type format with five response options, "always," "frequently," "sometimes," "seldom," and "never." The items on the scale have been categorized into four subscales as "elaboration" (18 items), "organization" (8 items), "rehearsal" (7 items) and "comprehension monitoring" (6 items). Examples that illustrate subscale items for the R-LSSPL are: *Elaboration:* "I learn subject matter by relating it to daily life;" "I always compare what I have just learnt to my existing knowledge.", *Comprehension monitoring:* "When I cannot answer a question or solve a problem, I always think of what could be the reason for that;" "I try to notice what knowledge I lack.", *Rehearsal:* "I always review my lecture notes the same day, either orally or by rewriting them;" "I always go over the example problems that my instructor solved in class, and try to solve those again.", and *Organization:* "I draw charts in order to understand the relationship between concepts;" "To comprehend a case in physics, I either draw its picture or a diagram."

Learning strategies (LSs) are defined as “behaviors and thoughts that a learner uses for processing information during learning” (Weinstein & Mayer, 1986). There are various different classifications of LSs. Cognitive psychologists divide LSs into two main categories: cognitive and metacognitive. Vaidya (1999) describes these strategies as follows: Cognitive strategies are used in cognitive processes by helping a person to manipulate information such as note taking or asking questions, through various rehearsal, elaboration and organizational strategies. Vaidya (1999) argues that cognitive strategies tend to be task specific, that is, certain cognitive strategies are helpful only when learning or processing certain tasks. Metacognitive strategies are described as executive in nature (Vaidya, 1999), used for planning, monitoring and evaluating learning and for regulating progress (Najar, 1999).

Bab V Kesimpulan dan Saran

A. Kesimpulan

Studi analisis matakuliah dengan menggunakan analisis faktor belum feasibel dilakukan di UT umumnya dan khususnya di PFIS FKIP-UT. Hal tersebut adalah mengingat sedikitnya data jumlah mahasiswa yang dapat dianalisis per semesternya

B. Kesimpulan

Studi analisis matakuliah dengan menggunakan analisis faktor hanya feasibel dilakukan di UT hanya untuk mata kuliah dengan jumlah peserta ujian yang banyak. Untuk matakuliah dengan jumlah mahasiswa peserta ujian sedikit diperlukan metode analisis lain.

Pustaka

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